



Review Article

## Effects of Organic Amendments on Soil Fertility and Environmental Quality: A Review

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**Abstract:** The main objective of this paper is to review the main effects of organic amendments on soil fertility and environmental quality. The review showed that both organic amendment types could improve the physical, chemical and biological characteristics of soil and environmental quality in a dose dependent manner and frequency of application. Application of organic amendments lower soil bulk density values by more than 5% versus sole urea fertilized soil and for each 1% increase inorganic matter, soil water holding capacity increased by up to 3.7%. Organic amendments play a positive role in chemical characteristics of the soil including increase in organic carbon (up to 58% with 120 t ha<sup>-1</sup> versus unfertilized soil) and organic nitrogen up to 90% depending on the type and the level applied. Repeated application of organic amendments to cropland led to an improvement of microbial biomass by up to 100% and increased enzymatic activity by 30%. Organic amendments also play a positive role in climate change mitigation by soil carbon sequestration although the size of which is dependent on their type, rates and frequency of application. However, organic amendments have more of long-term return rather than short-term positive effect and there is competition of organic materials for the purpose of fodder or fuel. As a result, additional measures such as physical and biological soil conservation measures should get due attention and it is better to use the combination of organic and inorganic fertilizers in order to sustain soil fertility and environmental quality.

**Keywords:** Organic Amendments, Soil Fertility, Environmental Quality, Compost, Farmyard Manure

### 1. Introduction

As population pressure increases and fallow cycles shortened, rapid depletion of nutrients in smallholder farms is one of the major problems affecting food production in Africa including Ethiopia [1]. Soil nutrient replenishment is therefore a prerequisite for halting soil fertility decline. Organic sources of plant nutrients as organic amendment could remain the principal sources for the maintenance of soil fertility and environmental quality, and this may also accomplished through the application of mineral and organic fertilizers [2, 3].

Organic materials derived from plants and animals might possess many characteristics that can improve soil fertility, quality of the environment and enhance crop performance.

These materials can be particularly useful as amendments to severely degraded soils associated with mining activities [4]. As a result, organic amendments (OAs) can be defined as any materials originated from plants and animals and added/or incorporated into the soil for the improvement and/or replacement of physical, chemical and biological properties of soil and in turn to make the environment suitable for production and productivity [5, 6].

The management of nutrients to maintain productivity and quality in crop production systems is great challenge that must be met through a combination of organic materials and management of soil organic matter (OM).

The management strategies might include use of leguminous crops, household wastes, crop residues, compost and manures [7]. In long-term soil conservation and/or

# Soil Amendments And Environmental Quality

**Arturo Cuomo**



## **Soil Amendments And Environmental Quality:**

**Soil Amendments and Environmental Quality** Jack E. Rechcigl, 1995-09-25 This book presents a comprehensive and balanced overview of soil amendments and their effect on the environment. It encompasses both positive and negative aspects of chemical fertilizers that supply nitrogen, phosphorous, sulfur, lime, micronutrients, and trace metals. Pros and cons are discussed with respect to the optimal and the most environmentally sound use of soil amendments, and guidance is provided on how to minimize the environmental effects of amendments. Natural fertilizers including manure, sludge, fly ash, phosphogypsum, and byproduct gypsum are also discussed. Alternative agronomic practices and biotechnology that ameliorate or minimize potential adverse effects of fertilizer use are examined in detail. This authoritative and up-to-date treatise is multidisciplinary in nature and international in scope, a powerful reference tool for researchers, a thorough guide for practitioners and policy makers, and an excellent text book for academic courses. **Soils and Environmental Quality**

Gary M. Pierzynski, George F. Vance, J. Thomas Sims, 2005-05-02 A perpetual bestseller, this third edition explores environmental quality from the perspective of soil science. The coverage ranges from the theoretical to the practical, with an abundance of examples such as an exploration of allowable pesticide concentrations in drinking water and an inquiry into soil contamination from the trace elements in organic byproducts. It also explores the use of soil carbon sequestration as a remedy for global climate change and the effects of acid precipitation on forestation. Case studies with political, economic, and legal implications illustrate the human side of environmental problems. Also covered is the use or misuse of the Scientific Method and the potential for factual bias. The three authors, all teaching professors distinguished in soil science, have updated this student favorite to include a greater number of even more relevant topics. Responding to request, *Soil Amendments for Sustainability*

Amitava Rakshit, Binoy Sarkar, Purushothaman Abhilash, 2018-09-03 This book focuses on the pros and cons of amendment materials to restore the functioning of soil resources. It presents a holistic overview on affected land revitalization, clean up, and revegetation using these amendments that could be implemented in the long-term management of the soil-plant-atmosphere-animal continuum. *Sustainable Agriculture towards Food Security* Arulbalachandran

Dhanarajan, 2017-11-16 World's population is projected to reach 9.7 billion in 2050 and 11.2 billion in 2100. To meet the food demands of the exponentially increasing population, a massive food production is necessary. Agricultural production on land and aquatic systems poses negative impacts on the earth's ecosystems. Combined effects of climate change, land degradation, cropland losses, water scarcity, and species infestations are major causes for loss of agricultural yields up to 25%. Therefore, the world needs a paradigm shift in agriculture development for sustainable food production and security through green revolution and eco-friendly approaches. Hence, agriculture practices must be sustained by the ability of farm land to produce food to satisfy human needs indefinitely, as well as having sustainable impacts on the broader environment. The real agricultural challenges of the future, as well as for today, differ according to their geopolitical and socioeconomic contexts.

Therefore sustainable agriculture must be inclusive and have adaptability and flexibility over time to respond to demands for food production. Considering all these points, this book has been prepared to address and insights to generate awareness of food security and focuses on perspectives of sustainable food production and security towards human society. The book facilitates to describes the classical and recent advancement of technologies and strategies by sustainable way through plant and animal origin including breeding pest management tissue culture transgenic techniques bio and phytoremediation environmental stress and resistance plant growth enhancing microbes bio fertilizer and integrated approaches of food nutrition. Chapters provide a new dimension to discuss the issues challenges and strategies of agricultural sustainability in a comprehensive manner. It aims at educating the students advanced and budding researchers to develop novel approaches for sustainability with environmentally sound practices. Handbook of Soil Sciences (Two Volume Set) Pan Ming

Huang, Yuncong Li, Malcolm E. Sumner, 2018-10-03. An evolving living organic inorganic covering soil is in dynamic equilibrium with the atmosphere above the biosphere within and the geology below. It acts as an anchor for roots, a purveyor of water and nutrients, a residence for a vast community of microorganisms and animals, a sanitizer of the environment and a source of raw materials for co. **Diffuse Pollution of Water Resources** Roumiana Hranova, 2006-01-16. Diffuse pollution of water resources has a multi disciplinary dimension and the measures to prevent and control it are closely inter related to the development patterns and societal habits of the region. This book aims to bridge the gaps between different specialists working in the field and to present an integrated approach for the solution of diffuse pollution problems. It focuses on cases specific to developing countries and emphasizes the need to pursue environmentally sustainable development patterns. Basic principles, definitions and approaches are presented enabling a common language and understanding among professionals in the field. Numerous case studies from the region mainly related to urban sources of diffuse pollution are included. They could be regarded as typical for any developing country suggesting tools and methods to assess and evaluate the extent of diffuse pollution problems. The book is valuable as a supplementary text for undergraduate and postgraduate students whose studies include a component of water resources and environmental engineering and management including degree courses in Environmental Civil and Chemical Engineering, Soil Science, Environmental Sciences and Public Health related sciences. It is also a valuable guide for professionals and managers working in the field of Water Resources and Environmental protection.

**Encyclopedia of Animal Science (Print)** Wilson G. Pond, 2004-11-16. PRINT ONLINE PRICING OPTIONS AVAILABLE UPON REQUEST AT [reference.taylorandfrancis.com](http://reference.taylorandfrancis.com). *Phosphate in Soils* H. Magdi Selim, 2018-10-08. Edited by One of the Best Specialists in Soil Science. Recent studies reveal that Phosphorus (P) in the form of phosphate, a macronutrient essential for plant growth and crop yields, can influence the bioavailability, retention and mobility of trace elements, metal ions and radio nuclides in soils. When this occurs, phosphates can affect the dynamics of heavy metals and influence soil characteristics impacting soil mobility and toxicity. *Phosphate in Soils: Interaction with Micronutrients, Radionuclides and*

Heavy Metals utilizes the latest research to emphasize the role that phosphate plays in enhancing or reducing the mobility of heavy metals in soil and the soil water plant environment. It provides an in depth understanding of each heavy metal species and expands on phosphate interactions in geological material. Composed of 12 chapters this text Provides an overview of the reactions of metalloid s and common P compounds that are used as fertilizer in soils. Emphasizes the effect of phosphorus on copper and zinc adsorption in acid soils. Discusses findings on the influence of phosphate compounds on speciation mobility and bioavailability of heavy metals in soils as well as the role of phosphates on in situ and phytoremediation of heavy metals for contaminated soils. Places emphasis on the influence of phosphate on various heavy metals species in soils and their solubility mobility and availability. Provides extensive information on testing various high phosphate materials for remediation of heavy metal micronutrients and radionuclides contaminated sites. Explores the reactivity of heavy metals micronutrients and radionuclides elements in several soils. Presents a case study illustrating various remediation efforts of acidic soils and remediation of Cu Zn and lead Pb contaminated soils around nonferrous industrial plants. Emphasizes the significance of common ions cations and anions on phosphate mobility and sorption in soils and more. The author includes analytical and numerical solutions along with hands on applications and addresses other topics that include the transport and sorption modeling of heavy metals in the presence of phosphate at different scales in the vadose zone.

*Environmental Materials and Waste* Majeti Narasimha Vara Prasad, Kaimin Shih, 2016-04-19 *Environmental Materials and Waste* Resource Recovery and Pollution Prevention contains the latest information on environmental sustainability as a wide variety of natural resources are increasingly being exploited to meet the demands of a worldwide growing population and economy. These raw materials cannot or can only partially be substituted by renewable resources within the next few decades. As such the efficient recovery and processing of mineral and energy resources as well as recycling such resources is now of significant importance. The book takes a multidisciplinary approach to fully realize the number of by products which can be remanufactured providing the foundation needed across disciplines to tackle this issue. As awareness and opportunities to recover valuable resources from process and bleed streams is gaining interest sustainable recovery of environmental materials including wastewater offers tremendous opportunity to combine profitable and sustainable production. Presents a state of the art guide to environmental sustainability. Provides an overview of the field highlighting recent and emerging issues in environmental resource recovery that cover a wide array of by products for remanufacture potential. Details a multidisciplinary approach to fully realize the number of by products which can be remanufactured providing the foundation needed across disciplines to tackle these global issues.

*Agricultural Productivity and Environmental Quality* United States. Congress. House. Committee on Science and Technology. Subcommittee on Natural Resources and Environment, 1980

**Phytomicrobiome Interactions and Sustainable Agriculture** Amit Verma, Jitendra Kumar Saini, Harikesh Bahadur Singh, Abd El-Latif Hesham, 2021-01-19 A guide to the role microbes play in the enhanced production and productivity of

agriculture to feed our growing population *Phytomicrobiome Interactions and Sustainable Agriculture* offers an essential guide to the importance of Phytomicrobiome and explores its various components The authors noted experts on the topic explore the key benefits of plant development such as nutrient availability amelioration of stress and defense to plant disease Throughout the book the authors introduce and classify the corresponding Phytomicrobiome components and then present a detailed discussion related to its effect on plant development controlling factors of this biome its behaviour under the prevailing climate change condition and beneficial effects The book covers the newly emerging technical concept of Phytomicrobiome engineering which is an advanced concept to sustain agricultural productivity in recent climatic scenario The text is filled with comprehensive cutting edge data making it possible to access this ever growing wealth of information This important book Offers a one stop resource on phytomicrobiome concepts Provides a better understanding of the topic and how it can be employed for understanding plant development Contains a guide to sustaining agriculture using phytomicrobiome engineering Presents information that can lead to enhanced production and productivity to feed our growing population Written for students researchers and policy makers of plant biology *Phytomicrobiome Interactions and Sustainable Agriculture* offers a clear understanding of the importance of microbes in overall plant growth and development

*Principles, Application and Assessment in Soil Science* Burcu E. Ozkaraova Gungor,2011-12-22 Our dependence on soil and our curiosity about it is leading to the investigation of changes within soil processes Furthermore the diversity and dynamics of soil are enabling new discoveries and insights which help us to understand the variations in soil processes Consequently this permits us to take the necessary measures for soil protection thus promoting soil health This book aims to provide an up to date account of the current state of knowledge in recent practices and assessments in soil science Moreover it presents a comprehensive evaluation of the effect of residue waste application on soil properties and further on the mechanism of plant adaptation and plant growth Interesting examples of simulation using various models dealing with carbon sequestration ecosystem respiration and soil landscape etc are demonstrated The book also includes chapters on the analysis of areal data and geostatistics using different assessment methods More recent developments in analytical techniques used to obtain answers to the various physical mechanisms chemical and biological processes in soil are also present

*A National Program of Research for Environmental Quality* Joint Task Force of the U.S. Dept. of Agriculture and the State Universities and Land Grant Colleges,Task Force on Environmental Quality--Pollution in Relation to Agriculture and Forestry (U.S.),1968

*Environmental Quality Research and Development: a Review and Analysis of Federal Programs* Federal Council for Science and Technology (U.S.). Ad Hoc Committee on Environmental Quality Research and Development,1972

**Soil Health Analysis, Set** Douglas L. Karlen,Diane E. Stott,Maysoon M. Mikha,2021-08-13 Volume 1 briefly reviews selected Approaches to Soil Health Analysis including a brief history of the concept challenges and opportunities meta data and assessment applications to forestry and urban land reclamation and future soil health

monitoring and evaluation approaches Volume 2 focuses on Laboratory Methods for Soil Health Analysis including an overview and suggested analytical approaches intended to provide meaningful comparable data so that soil health can be used to guide restoration and protection of our global soil resources *Approaches to Soil Health Analysis (Soil Health series, Volume 1)* Douglas L. Karlen, Diane E. Stott, Maysoon M. Mikha, 2021-08-13

*Approaches to Soil Health Analysis* A concise survey of soil health analysis and its various techniques and applications The maintenance of healthy soil resources provides the foundation for an array of global efforts and initiatives that affect humanity Whether they are working to combat food shortages conserve our ecosystems or mitigate the impact of climate change researchers and agriculturalists the world over must be able to correctly examine and understand the complex nature of this essential fragile resource These new volumes have been designed to meet this need addressing the many dimensions of soil health analysis in chapters that are concise accessible and applicable to the tasks at hand

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**Indicators of Environmental Quality** William Thomas, 2013-03-09 Researchers and agencies collect reams of objective data and authors publish volumes of subjective prose in attempts to explain what is meant by environmental quality Still we have no universally recognized methods for combining our quantitative measures with our qualitative concepts of environment Not all of our environmental goals should be reduced to mere numbers but many of them can be and without these quantitative terms we have no way of defining our present position nor of selecting positions we wish to attain on any logically established scale of environmental values Stated simply in our zeal to measure our environment we often forget that masses of numbers describing a system are insufficient to understand it or to be used in selecting goals and priorities for expending our economic and human resources Attempts at quantitatively describing environmental quality rather than merely measuring different environmental variables are relatively recent This condensing of data into the optimum number of terms with maximum information content is a truly interdisciplinary challenge

When Oak Ridge National Laboratory initiated its Environmental Program in early 1970 under a grant from the National Science Foundation the usefulness of environmental indicators in assessing the effects of technology was included as one of the initial areas for investigation James L Liverman through his encouragement and firm belief that these indicators are indispensable if we are to resolve our complex environmental problems deserves much of the credit for the publication of this book

Toxicology Research Projects Directory ,1978 *Encyclopedia of the Anthropocene*

,2017-11-27 Encyclopedia of the Anthropocene Five Volume Set presents a currency based global synthesis cataloguing the impact of humanity's global ecological footprint Covering a multitude of aspects related to Climate Change Biodiversity Contaminants Geological Energy and Ethics leading scientists provide foundational essays that enable researchers to define and scrutinize information ideas relationships meanings and ideas within the Anthropocene concept Questions widely debated among scientists humanists conservationists politicians and others are included providing discussion on when the Anthropocene began what to call it whether it should be considered an official geological epoch whether it can be contained in time and how it will affect future generations Although the idea that humanity has driven the planet into a new geological epoch has been around since the dawn of the 20th century the term Anthropocene was only first used by ecologist Eugene Stoermer in the 1980s and hence popularized in its current meaning by atmospheric chemist Paul Crutzen in 2000 Presents comprehensive and systematic coverage of topics related to the Anthropocene with a focus on the Geosciences and Environmental science Includes point counterpoint articles debating key aspects of the Anthropocene giving users an even handed navigation of this complex area Provides historic seminal papers and essays from leading scientists and philosophers who demonstrate changes in the Anthropocene concept over time Essential Plant Nutrients M. Naeem, Abid A. Ansari, Sarvajeet Singh Gill, 2017-08-07 This book explores the agricultural commercial and ecological future of plants in relation to mineral nutrition It covers various topics regarding the role and importance of mineral nutrition in plants including essentiality availability applications as well as their management and control strategies Plants and plant products are increasingly important sources for the production of energy biofuels and biopolymers in order to replace the use of fossil fuels The maximum genetic potential of plants can be realized successfully with a balanced mineral nutrients supply This book explores efficient nutrient management strategies that tackle the over and under use of nutrients check different kinds of losses from the system and improve use efficiency of the plants Applied and basic aspects of ecophysiology biochemistry and biotechnology have been adequately incorporated including pharmaceuticals and nutraceuticals agronomical breeding and plant protection parameters propagation and nutrients managements This book will serve not only as an excellent reference material but also as a practical guide for readers cultivators students botanists entrepreneurs and farmers



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